

IN THE CLAIMS

Please amend the claims as follows:

1-137. (Canceled)

138. (Previously Presented) A processing method, comprising:

exposing a first surface of a first substrate to a plasma;

cleaning said first surface after exposure to said plasma;

terminating said first surface with a chemical species after said cleaning step; and

bonding said first surface to a second surface of a second substrate after said

terminating step.

139. (Previously Presented) A method as recited in claim 138, wherein terminating comprises:

immersing said first surface in a solution.

140. (Previously Presented) A method as recited in claim 138, wherein terminating comprises:

immersing said first surface in an N-based solution.

141. (Previously Presented) A method as recited in claim 138, wherein terminating comprises:

immersing said first surface in an ammonia-based solution.

142. (Previously Presented) A method as recited in claim 138, comprising:

performing said exposing, cleaning and terminating steps, in order, on said second surface of said second substrate prior to said bonding step.

143. (Previously Presented) A method as recited in claim 138, comprising:

forming a first bonding layer on said first substrate, and

performing said exposing, cleaning and terminating steps on a third surface of said first bonding layer.

144. (Previously Presented) A method as recited in claim 143, comprising:
forming a second bonding layer on said second substrate, and
performing said exposing, cleaning and terminating steps on a fourth surface of said second bonding layer formed on said second substrate.

145. (Previously Presented) A method as recited in claim 138, wherein said cleaning step comprises removing contaminants from said first surface.

146. (Previously Presented) A method as recited in claim 138, wherein:
said cleaning step comprises a dry process.

147. (Previously Presented) A method as recited in claim 146, wherein:
said terminating step comprises a dry process.

148. (Previously Presented) A method as recited in claim 146, wherein:
said terminating step comprises a wet process.

149. (Previously Presented) A processing method, comprising:
exposing a first surface of a first substrate to a first dry process to at least etch said first surface;

exposing said first surface to a second dry process to at least clean said first surface;
terminating said first surface with a chemical species; and
bonding said first surface to a second surface of a second substrate after said terminating step.

150. (Previously Presented) A method as recited in claim 149, comprising:
performing said exposing, cleaning and terminating steps, in order, on said second surface of said second substrate prior to said bonding step.

151. (Previously Presented) A method as recited in claim 149, comprising:
forming a first bonding layer on said first substrate, and

performing said exposing, cleaning and terminating steps on a third surface of said first bonding layer.

152. (Previously Presented) A method as recited in claim 151, comprising:
forming a second bonding layer on said second substrate, and
performing said exposing, cleaning and terminating steps on a fourth surface of said second bonding layer formed on said second substrate.

153. (Previously Presented) A method as recited in claim 149, wherein said cleaning step comprises removing contaminants from said first surface.

154. (Previously Presented) A method as recited in claim 149, comprising:
bonding said first surface to said second surface at about room temperature.

155. (Previously Presented) A method as recited in claim 149, comprising:
obtaining a bond strength at about room temperature sufficient to permit at least one of grinding and polishing of one of said first and second substrates.

156. (Previously Presented) A method as recited in claim 149, comprising:
obtaining a bond strength of at least about 500 mJ/m^2 at about room temperature.

157. (Previously Presented) A method as recited in claim 149, comprising:
obtaining a bond strength of at least about 1000 mJ/m^2 at about room temperature.

158. (Previously Presented) A method as recited in claim 149, comprising:
obtaining a bond strength of at least about 2000 mJ/m^2 at about room temperature.

159. (Previously Presented) A method as recited in claim 149, wherein:
forming a chemical bond at about room temperature.

160. (Previously Presented) A method as recited in claim 149, wherein:
said second dry process comprises a NH_3 plasma process.

161. (Previously Presented) A method as recited in claim 138, comprising:
bonding said first surface to said second surface at about room temperature.

162. (Previously Presented) A method as recited in claim 138, comprising:
obtaining a bond strength at about room temperature sufficient to permit at least one
of grinding and polishing of one of said first and second substrates.

163. (Previously Presented) A method as recited in claim 138, comprising:
obtaining a bond strength of at least about 500 mJ/m^2 at about room temperature.

164. (Previously Presented) A method as recited in claim 138, comprising:
obtaining a bond strength of at least about 1000 mJ/m^2 at about room temperature.

165. (Previously Presented) A method as recited in claim 138, comprising:
obtaining a bond strength of at least about 2000 mJ/m^2 at about room temperature.

166. (Previously Presented) A method as recited in claim 138, wherein:
forming a chemical bond at about room temperature.

167. (Previously Presented) A method as recited in claim 138, wherein said cleaning
step comprises cleaning said first surface with an ammonia-based process.

168. (Previously Presented) A processing method, comprising:
exposing a first surface of a first element to a first dry process to at least etch said first
surface;
exposing said first surface to a second dry process to at least clean said first surface;
terminating said first surface with a chemical species; and
bonding said first surface to a second surface of a second element after said
terminating step.

169. (Previously Presented) A method as recited in claim 168, wherein terminating
comprises:
immersing said first surface in a solution.

170. (Previously Presented) A method as recited in claim 168, wherein terminating
comprises:

immersing said first surface in an N-based solution.

171. (Previously Presented) A method as recited in claim 168, wherein terminating comprises:

immersing said first surface in an ammonia-based solution.

172. (Previously Presented) A method as recited in claim 168, comprising:
performing said exposing, cleaning and terminating steps, in order, on said second surface prior to said bonding step.

173. (Previously Presented) A method as recited in claim 168, comprising:
forming a first bonding layer on said first element, and
performing said exposing, cleaning and terminating steps on a third surface of said first bonding layer.

174. (Previously Presented) A method as recited in claim 173, comprising:
forming a second bonding layer on said second element, and
performing said exposing, cleaning and terminating steps on a fourth surface of said second bonding layer.

175. (Previously Presented) A method as recited in claim 168, wherein said cleaning step comprises removing contaminants from said first surface.

176. (Canceled)

177. (Currently Amended) A method as recited in claim 168 ~~176~~, wherein:
said terminating step comprises a dry process.

178. (Currently Amended) A method as recited in claim 168 ~~176~~, wherein:
said terminating step comprises a wet process.

179. (Previously Presented) A method as recited in claim 168, comprising:
bonding said first surface to said second surface at about room temperature.

180. (Previously Presented) A method as recited in claim 168, comprising:

obtaining a bond strength at about room temperature sufficient to permit at least one of grinding and polishing of one of said first and second elements.

181. (Previously Presented) A method as recited in claim 168, comprising:
obtaining a bond strength of at least about 500 mJ/m^2 at about room temperature.

182. (Previously Presented) A method as recited in claim 168, comprising:
obtaining a bond strength of at least about 1000 mJ/m^2 at about room temperature.

183. (Previously Presented) A method as recited in claim 168, comprising:
obtaining a bond strength of at least about 2000 mJ/m^2 at about room temperature.

184. (Previously Presented) A method as recited in claim 168, wherein:
forming a chemical bond at about room temperature.

185. (Previously Presented) A method as recited in claim 168, wherein said cleaning step comprises cleaning said first surface with an ammonia-based process.

186. (Previously Presented) A processing method, comprising:
exposing a first surface of a first element to a plasma;
cleaning said first surface after exposure to said plasma;
terminating said first surface with a chemical species after said cleaning step; and
bonding said first surface to a second surface of a second element after said terminating step.

187. (Previously Presented) A method as recited in claim 186, comprising:
performing said exposing, cleaning and terminating steps, in order, on said second surface prior to said bonding step.

188. (Previously Presented) A method as recited in claim 186, comprising:
forming a first bonding layer on said first element, and
performing said exposing, cleaning and terminating steps on a third surface of said first bonding layer.

189. (Previously Presented) A method as recited in claim 188, comprising:
forming a second bonding layer on said second element, and
performing said exposing, cleaning and terminating steps on a fourth surface of said second bonding layer.

190. (Previously Presented) A method as recited in claim 186, wherein said cleaning step comprises removing contaminants from said first surface.

191. (Previously Presented) A method as recited in claim 186, comprising:
bonding said first surface to said second surface at about room temperature.

192. (Previously Presented) A method as recited in claim 186, comprising:
obtaining a bond strength at about room temperature sufficient to permit at least one of grinding and polishing of one of said first and second elements.

193. (Previously Presented) A method as recited in claim 186, comprising:
obtaining a bond strength of at least about 500 mJ/m^2 at about room temperature.

194. (Previously Presented) A method as recited in claim 186, comprising:
obtaining a bond strength of at least about 1000 mJ/m^2 at about room temperature.

195. (Previously Presented) A method as recited in claim 186, comprising:
obtaining a bond strength of at least about 2000 mJ/m^2 at about room temperature.

196. (Previously Presented) A method as recited in claim 186, wherein:
forming a chemical bond at about room temperature.

197. (Previously Presented) A method as recited in claim 186, wherein:
said cleaning step comprises a NH_3 plasma process.

198. (Previously Presented) A method as recited in claim 186, comprising:
heating said first and second elements to a temperature no more than about 200°C .

199. (Previously Presented) A method as recited in claim 198, comprising:
obtaining a bond strength of at least about 500 mJ/m^2 .

200. (Previously Presented) A method as recited in claim 198, comprising:
obtaining a bond strength of at least about 1000 mJ/m².
201. (Previously Presented) A method as recited in claim 198, comprising:
obtaining a bond strength of at least about 2000 mJ/m².
202. (Previously Presented) A method as recited in claim 186, comprising:
heating said first and second elements to a temperature in a range about 75-100° C.
203. (Previously Presented) A method as recited in claim 202, comprising:
obtaining a bond strength of at least about 500 mJ/m².
204. (Previously Presented) A method as recited in claim 202, comprising:
obtaining a bond strength of at least about 1000 mJ/m².
205. (Previously Presented) A method as recited in claim 202, comprising:
obtaining a bond strength of at least about 2000 mJ/m².
206. (Previously Presented) A method as recited in claim 186, comprising:
heating said first and second elements to increase a bond strength between said first
and second elements.
207. (Previously Presented) A method as recited in claim 206, comprising:
obtaining a bond strength of at least about 500 mJ/m².
208. (Previously Presented) A method as recited in claim 206, comprising:
obtaining a bond strength of at least about 1000 mJ/m².
209. (Previously Presented) A method as recited in claim 206, comprising:
obtaining a bond strength of at least about 2000 mJ/m².
210. (Previously Presented) A method as recited in claim 186, wherein:
each of said first and second elements is a substrate.
211. (Previously Presented) A method as recited in claim 149, comprising:
heating said first and second substrates to a temperature no more than about 200° C.

212. (Previously Presented) A method as recited in claim 211, comprising:
obtaining a bond strength of at least about 500 mJ/m².
213. (Previously Presented) A method as recited in claim 211, comprising:
obtaining a bond strength of at least about 1000 mJ/m².
214. (Previously Presented) A method as recited in claim 211, comprising:
obtaining a bond strength of at least about 2000 mJ/m².
215. (Previously Presented) A method as recited in claim 149, comprising:
heating said first and second substrates to a temperature in a range about 75-100° C.
216. (Previously Presented) A method as recited in claim 215, comprising:
obtaining a bond strength of at least about 500 mJ/m².
217. (Previously Presented) A method as recited in claim 215, comprising:
obtaining a bond strength of at least about 1000 mJ/m².
218. (Previously Presented) A method as recited in claim 215, comprising:
obtaining a bond strength of at least about 2000 mJ/m².
219. (Previously Presented) A method as recited in claim 149, comprising:
heating said first and second substrates to enhance a bond strength between said first
and second substrates.
220. (Previously Presented) A method as recited in claim 219, comprising:
obtaining a bond strength of at least about 500 mJ/m².
221. (Previously Presented) A method as recited in claim 219, comprising:
obtaining a bond strength of at least about 1000 mJ/m².
222. (Previously Presented) A method as recited in claim 219, comprising:
obtaining a bond strength of at least about 2000 mJ/m².
223. (Previously Presented) A method as recited in claim 138, comprising:
heating said first and second substrates to a temperature no more than about 200° C.

224. (Previously Presented) A method as recited in claim 223, comprising:
obtaining a bond strength of at least about 500 mJ/m².
225. (Previously Presented) A method as recited in claim 223, comprising:
obtaining a bond strength of at least about 1000 mJ/m².
226. (Previously Presented) A method as recited in claim 223, comprising:
obtaining a bond strength of at least about 2000 mJ/m².
227. (Previously Presented) A method as recited in claim 138, comprising:
heating said first and second substrates to a temperature in a range about 75-100° C.
228. (Previously Presented) A method as recited in claim 227, comprising:
obtaining a bond strength of at least about 500 mJ/m².
229. (Previously Presented) A method as recited in claim 227, comprising:
obtaining a bond strength of at least about 1000 mJ/m².
230. (Previously Presented) A method as recited in claim 227, comprising:
obtaining a bond strength of at least about 2000 mJ/m².
231. (Previously Presented) A method as recited in claim 138, comprising:
heating said first and second substrates to enhance a bond strength between said first
and second substrates.
232. (Previously Presented) A method as recited in claim 231, comprising:
obtaining a bond strength of at least about 500 mJ/m².
233. (Previously Presented) A method as recited in claim 231, comprising:
obtaining a bond strength of at least about 1000 mJ/m².
234. (Previously Presented) A method as recited in claim 231, comprising:
obtaining a bond strength of at least about 2000 mJ/m².
235. (Currently Amended) A processing method, comprising:
exposing a first surface of a first element to a plasma;

cleaning said first surface after exposure to said plasma;
terminating said first surface with a chemical species after exposure to said plasma;
and
bonding said first surface to a second surface of a second element after said
terminating step.

236. (Currently Amended) A ~~processing method as recited in claim 235~~, comprising:
exposing a first surface of a first element to a plasma;
cleaning said first surface after exposure to said plasma and terminating said first
surface with a chemical species in a same step; and
bonding said first surface to a second surface of a second element after said
terminating step.

237. (Previously Presented) A method as recited in claim 235, comprising:
forming a first bonding layer on said first element, and
performing said exposing, cleaning and terminating on a surface of said first bonding
layer.

238. (Previously Presented) A method as recited in claim 237, comprising:
forming a second bonding layer on said second element, and
performing said exposing, cleaning and terminating on a surface of said second
bonding layer.

239. (Previously Presented) A method as recited in claim 235, wherein said cleaning
step comprises removing contaminants from said first surface.

240. (Previously Presented) A method as recited in claim 235, wherein:
said cleaning step comprises a dry process.

241. (Previously Presented) A method as recited in claim 235, wherein:
said terminating step comprises a dry process.

242. (Previously Presented) A method as recited in claim 235, comprising:
obtaining a bond strength sufficient to permit at least one of grinding and polishing of
one of said first and second elements.

243. (Previously Presented) A method as recited in claim 235, comprising:
obtaining a bond strength of at least about 500 mJ/m^2 .

244. (Previously Presented) A method as recited in claim 235, comprising:
obtaining a bond strength of at least about 1000 mJ/m^2 .

245. (Previously Presented) A method as recited in claim 235, comprising:
obtaining a bond strength of at least about 2000 mJ/m^2 .

246. (Previously Presented) A method as recited in claim 235, comprising:
forming a chemical bond between said first and second elements.

247. (Previously Presented) A method as recited in claim 235, comprising:
heating said first and second substrates to a temperature no more than about 200°C .

248. (Previously Presented) A method as recited in claim 247, comprising:
obtaining a bond strength of at least about 500 mJ/m^2 .

249. (Previously Presented) A method as recited in claim 247, comprising:
obtaining a bond strength of at least about 1000 mJ/m^2 .

250. (Previously Presented) A method as recited in claim 247, comprising:
obtaining a bond strength of at least about 2000 mJ/m^2 .

251. (Previously Presented) A method as recited in claim 235, comprising:
heating said first and second substrates to a temperature in a range about $75\text{-}100^\circ \text{C}$.

252. (Previously Presented) A method as recited in claim 251, comprising:
obtaining a bond strength of at least about 500 mJ/m^2 .

253. (Previously Presented) A method as recited in claim 251, comprising:
obtaining a bond strength of at least about 1000 mJ/m^2 .

254. (Previously Presented) A method as recited in claim 251, comprising:
obtaining a bond strength of at least about 2000 mJ/m².
255. (Previously Presented) A method as recited in claim 235, comprising:
heating said first and second substrates to enhance a bond strength between said first
and second elements.
256. (Previously Presented) A method as recited in claim 255, comprising:
obtaining a bond strength of at least about 500 mJ/m².
257. (Previously Presented) A method as recited in claim 255, comprising:
obtaining a bond strength of at least about 1000 mJ/m².
258. (Previously Presented) A method as recited in claim 255, comprising:
obtaining a bond strength of at least about 2000 mJ/m².
259. (Previously Presented) A method as recited in claim 235, wherein:
each of said first and second elements is a substrate.
260. (New) A method as recited in claim 236, comprising:
forming a first bonding layer on said first element, and
performing said exposing, cleaning and terminating on a surface of said first bonding
layer.
261. (New) A method as recited in claim 260, comprising:
forming a second bonding layer on said second element, and
performing said exposing, cleaning and terminating on a surface of said second
bonding layer.
262. (New) A method as recited in claim 236, wherein said cleaning step comprises
removing contaminants from said first surface.
263. (New) A method as recited in claim 236, wherein:
said cleaning step comprises a dry process.

264. (New) A method as recited in claim 236, wherein:
said terminating step comprises a dry process.
265. (New) A method as recited in claim 236, comprising:
obtaining a bond strength sufficient to permit at least one of grinding and polishing of
one of said first and second elements.
266. (New) A method as recited in claim 236, comprising:
obtaining a bond strength of at least about 500 mJ/m^2 .
267. (New) A method as recited in claim 236, comprising:
obtaining a bond strength of at least about 1000 mJ/m^2 .
268. (New) A method as recited in claim 236, comprising:
obtaining a bond strength of at least about 2000 mJ/m^2 .
269. (New) A method as recited in claim 236, comprising:
forming a chemical bond between said first and second elements.
270. (New) A method as recited in claim 236, comprising:
heating said first and second substrates to a temperature no more than about 200°C .
271. (New) A method as recited in claim 270, comprising:
obtaining a bond strength of at least about 500 mJ/m^2 .
272. (New) A method as recited in claim 270, comprising:
obtaining a bond strength of at least about 1000 mJ/m^2 .
273. (New) A method as recited in claim 270, comprising:
obtaining a bond strength of at least about 2000 mJ/m^2 .
274. (New) A method as recited in claim 236, comprising:
heating said first and second substrates to a temperature in a range about $75\text{-}100^\circ \text{C}$.
275. (New) A method as recited in claim 274, comprising:
obtaining a bond strength of at least about 500 mJ/m^2 .

276. (New) A method as recited in claim 274, comprising:
obtaining a bond strength of at least about 1000 mJ/m².
277. (New) A method as recited in claim 274, comprising:
obtaining a bond strength of at least about 2000 mJ/m².
278. (New) A method as recited in claim 236, comprising:
heating said first and second substrates to enhance a bond strength between said first
and second elements.
279. (New) A method as recited in claim 278, comprising:
obtaining a bond strength of at least about 500 mJ/m².
280. (New) A method as recited in claim 278, comprising:
obtaining a bond strength of at least about 1000 mJ/m².
281. (New) A method as recited in claim 278, comprising:
obtaining a bond strength of at least about 2000 mJ/m².
282. (New) A method as recited in claim 236, wherein:
each of said first and second elements is a substrate.
283. (New) A method as recited in claim 236, wherein:
said terminating step comprises a wet process.
284. (New) A method as recited in claim 236, wherein terminating comprises:
immersing said first surface in a solution.
285. (New) A method as recited in claim 236, wherein terminating comprises:
immersing said first surface in an N-based solution.
286. (New) A method as recited in claim 236, wherein terminating comprises:
immersing said first surface in an ammonia-based solution.
287. (New) A method as recited in claim 186, wherein:
said terminating step comprises a wet process.

288. (New) A method as recited in claim 186, wherein terminating comprises:
immersing said first surface in a solution.

289. (New) A method as recited in claim 186, wherein terminating comprises:
immersing said first surface in an N-based solution.

290. (New) A method as recited in claim 186, wherein terminating comprises:
immersing said first surface in an ammonia-based solution.

291. (New) A method as recited in claim 235, wherein:
said terminating step comprises a wet process.

292. (New) A method as recited in claim 235, wherein terminating comprises:
immersing said first surface in a solution.

293. (New) A method as recited in claim 235, wherein terminating comprises:
immersing said first surface in an N-based solution.

294. (New) A method as recited in claim 235, wherein terminating comprises:
immersing said first surface in an ammonia-based solution.

295. (New) A method as recited in claim 235, comprising:
terminating and cleaning in a same step.